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REFRIGERATOR-CAR DUSTERS

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The treating procedures[2] authorized for use as a basis for certification of products regulated by the Japanese beetle quarantine provide for the treatment of sacked white potatoes in refrigerator cars and trucks with DDT. This treatment involves the distribution of 1 ounce of 10-percent DDT dust per 2500 cubic feet before loading and an additional ounce after loading. Distribution of the insecticide is accomplished by means of an approved duster[3] (patent applied for) which uses carbon dioxide as the propellant. The operation of this duster involves a number of steps which were considered to be impractical in connection with the rapid treatment of large numbers of refrigerator cars. This paper describes two practical modifications of the approved duster, single-unit (plate 1) and double-unit (plate 2), which were used for the treatment of over 10,000 refrigerator cars and trucks during the summer of 1947.

The modified dusters were designed jointly by the Bureau of Entomology and Plant Quarantine and the Pennsylvania Railroad and were constructed at the Wilmington, Del., shops of the railroad. The final designs and blueprints[4] were completed on February 19, 1947, and construction was accomplished soon thereafter. Later, information regarding the modified dusters was made available to other railroads, State representatives, shippers, and others associated with the Japanese beetle quarantine. Large-scale use was begun late in June 1947.

1/The authors are indebted to G. J. Baetzhold, Division of Japanese Beetle Control, for the drawings presented in this paper.

2/U. S. Bureau of Entomology and Plant Quarantine. Treating procedures authorized for use as a basis for certification of products regulated by the Japanese beetle quarantine. Unnumbered publication. 49 pp. 1947. /Processed./

3/R. D. Chisholm, L. Koblitsky, W. C. Fest, and E. D. Burgess. Insecticide duster. U. S. Bur. Ent. and Plant Quar. ET-237. 5 pp. 1947. /Processed/

4/Blueprints prepared from vandykes furnished by the Pennsylvania Railroad may be obtained from the Bureau of Entomology and Plant Quarantine.

Description of the Dusters

The construction of the single-unit duster can best be described with reference to the numbered parts in plate 1.

The assembled duster is shown in figure 1. It consists of an insecticide container (1) attached to pipe (2), a measuring device (3) screwed onto the top of insecticide container (1), and a storage hopper (4) bolted onto the top of measuring device (3), equipped with an agitator (5), and supported by pipe (2) and brace (6).

The construction of insecticide container (1) is shown in figure 2. It consists of a pipe cap (7) into which is screwed a pipe nipple (8). A gas-inlet tube (9) extends from the upper end of nipple (8) through the bottom of pipe cap (7) into pipe (2). A longitudinal section is removed from the lower end of gas-inlet tube (9) to form scoop (10). An insecticide-outlet hole (11) is drilled through the bottom of pipe cap (7) into pipe (2).

The construction of measuring device (3) is shown in figures 2 and 3 (partly cut away). In figure 2 the measuring device (3) is shown in the same plane as in figure 1, whereas in figure 3 the plane is at right angles to that in figure 1. The bottom of housing (12) is threaded to accommodate the upper end of nipple (8), and the top is shaped for bolting to storage hopper (4). A tapered core (13) is fitted into housing (12) and is held in place by means of washer (14) and nut (15) screwed onto threaded end (16). A dished spring washer (14a) is used between the principal washer (14) and the nut (15) to keep the tapered core (13) constantly seated. A lug (17) is attached near the other end of core (13), which is shaped to provide a square head (16a). This end of core (13) and the end of housing (12) are shown in figure 4. A side view of this end of housing (12) is shown in figure 5. The upper half of the end of housing (12) is shaped to provide a notch having a vertical surface (18) and two horizontal surfaces (18a). The horizontal surfaces (18a) are opposite each other to engage lug (17), and thus permit rotation of core (13) through 180° and insure proper positioning of measuring cavity (20). Measuring cavity (20) and opening (21) are of the same inside diameter as nipple (8). Two views of rotating handle (19) are shown in figure 6.

The construction of storage hopper (4) is shown in figure 1. It is attached to measuring device (3) by several, preferably eight, machine screws equally spaced (22) and to pipe (2) and brace (6) by clamps (23). It is equipped with a hinged cover (24). A gasket (22a) is located between measuring device (3) and the hopper (4). The points (22b, figure 3) indicate threaded screw holes to receive the screws (22).

The construction of agitator (5) is shown in figure 1. It consists of a shaft (25) extending from above brace (6) almost to the top of measuring device (3). Vertical and horizontal views of agitator vanes (26) which are attached to shaft (25) are shown in figure 7. Shaft (25) is aligned by means of sleeve (27) attached to pipe (6), as shown in figure 8, and by a hole in cover (24). Knob (28)is fitted onto

the end of shaft (25) and held in place by set screw (29) and groove (30), as shown in figure 9. A coil compression spring (31) is secured on the shaft (25) by means of washer (32) and cotter pin (33), insuring a positive return of the agitator when forced downward in the dusting material.

The duster is connected to a carbon dioxide fire extinguisher by means of a flexible hose attached by pipe union (34). It is essential that the tank or supply line be equipped with a trigger release to insure economical use of propellent gas and best distribution of the insecticide.

The double-unit duster shown in plate 2 consists substantially of two single-unit dusters mounted on a plate so that the discharge ends of the pipes (2) are pointed in opposite directions. Forty-five-degree elbows are screwed onto the ends of the pipes. The vertical sections of the pipes (2) are eliminated, and the horizontal sections are joined by means of a tee which is connected to the gas source as described above.

Operation of the Dusters

To operate the duster, storage hopper (4) is filled with the insecticide; measuring device (3) is rotated to the charging position, as shown in figure 3, by means of rotating handle (19); knob (28) on agitator (5) is struck sharply several times causing the insecticide to fill measuring cavity (20); measuring device (3) is rotated through 180 degrees by means of handle (19), so that cavity (20) is in the discharging position as shown in figure 2; and high-velocity carbon dioxide is released into pipe (2). Part of the gas is diverted from pipe (2) into nipple (8) and cavity (20) by means of scoop (10) and gas-inlet tube (9), thereby causing the insecticide to enter pipe (2) through outlet hole (11). The insecticide is dispersed by the remainder of the gas and is discharged from pipe (2). After the storage hopper has been loaded the remainder of the operation requires less than 2 seconds.

To use the single-unit duster in refrigerator cars, the duster is lowered through a hatchway into an ice bunker, the end of pipe (2) is inserted through the screen, and the insecticide discharged as described above. These operations are repeated at the diagonally opposite end of the car.

To use the double-unit duster, the duster is placed on the floor of the car close to a doorway, so that the discharge pipes are parallel to the long axis of the car and the 45-degree elbows are directed upward at 45 degrees with reference to the car floor. Both units are discharged simultaneously so that an empty car may be dusted with one operation, which requires less than 2 seconds.

Each unit measures a charge of 1/2 ounce of a mixture consisting of 10 percent of DDT and 90 percent of pyrophyllite. This mixture is prepared by blending 20 parts by weight of a micronized mixture containing equal weights of DDT and pyrophyllite with 80 parts of pyrophyllite.

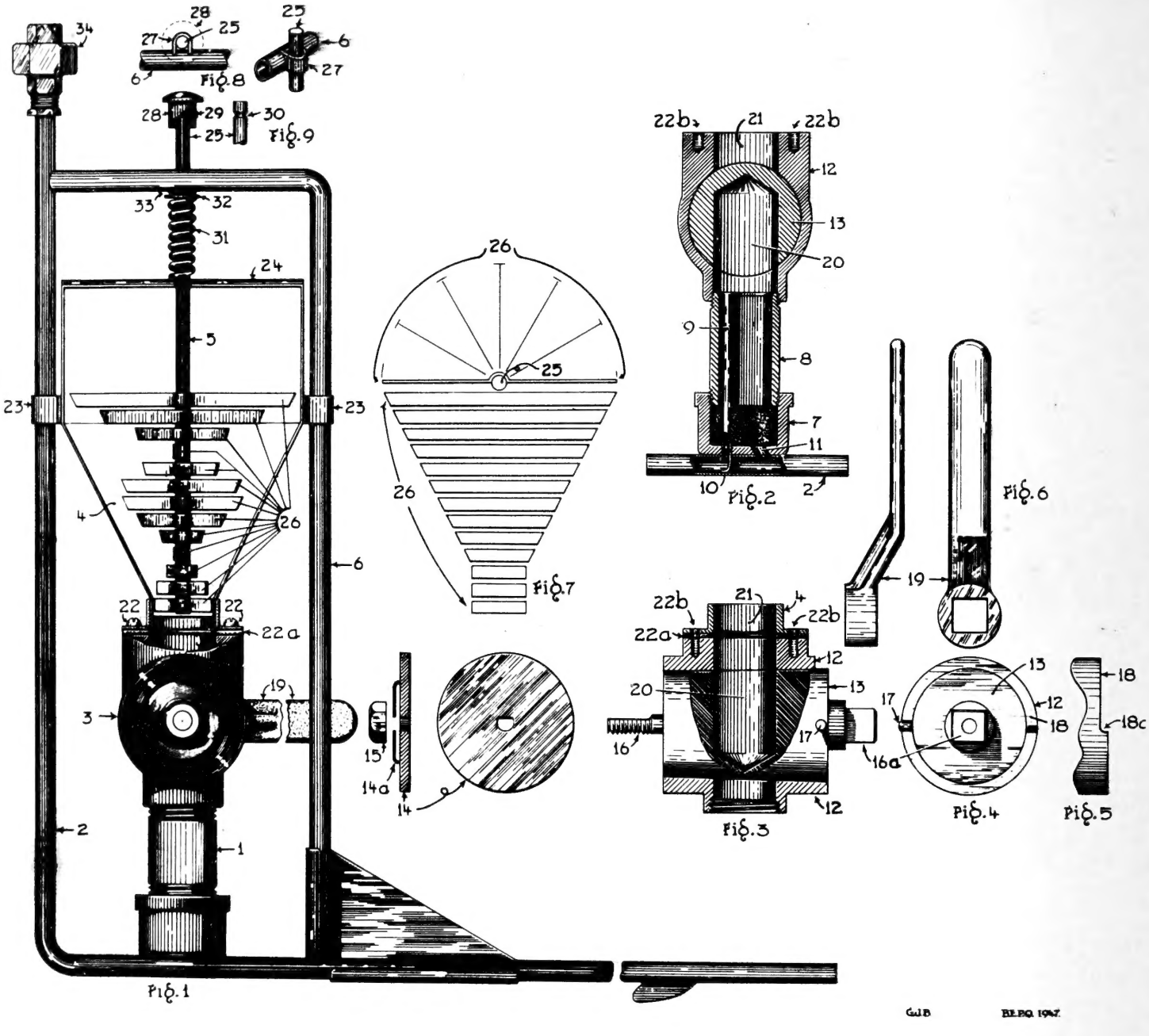

Plate 1.--Views of single-unit duster.

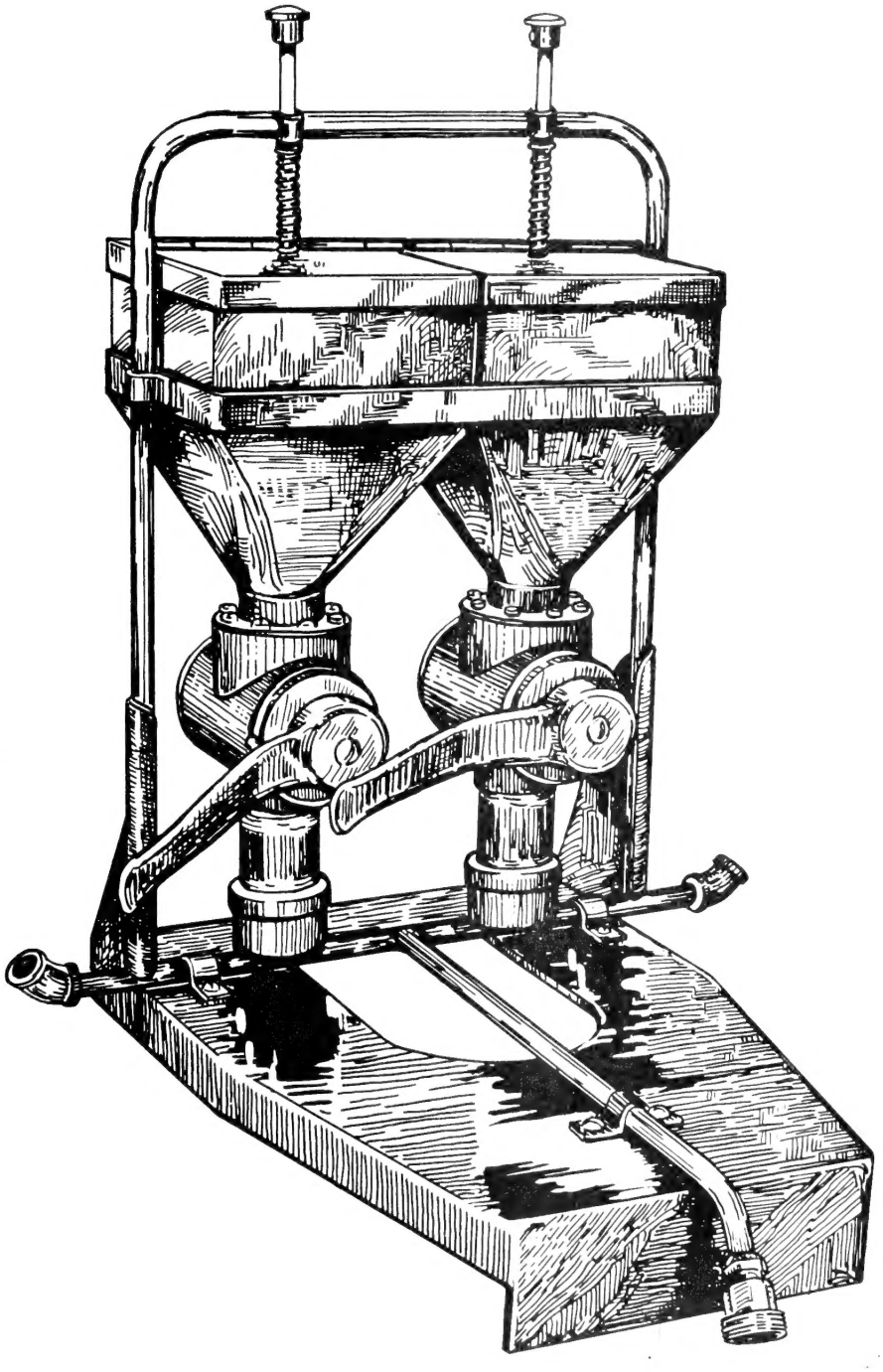

Plate 2.--View of double-unit duster.